

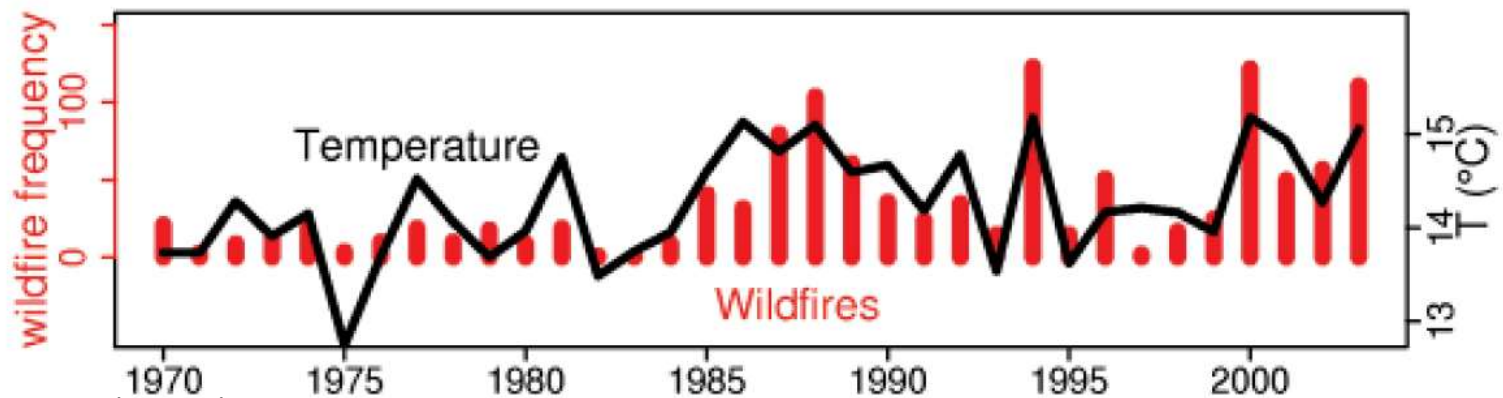
# Climate and Trajectory of Riparian Regrowth Mediate Mid-Term Patterns of Primary and Secondary Productivity After Wildfire in Wilderness Streams of Idaho

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# Changing Fire Regime in Western USA



**A** Western US Forest Wildfires and Spring–Summer Temperature



Westerling et al. 2006

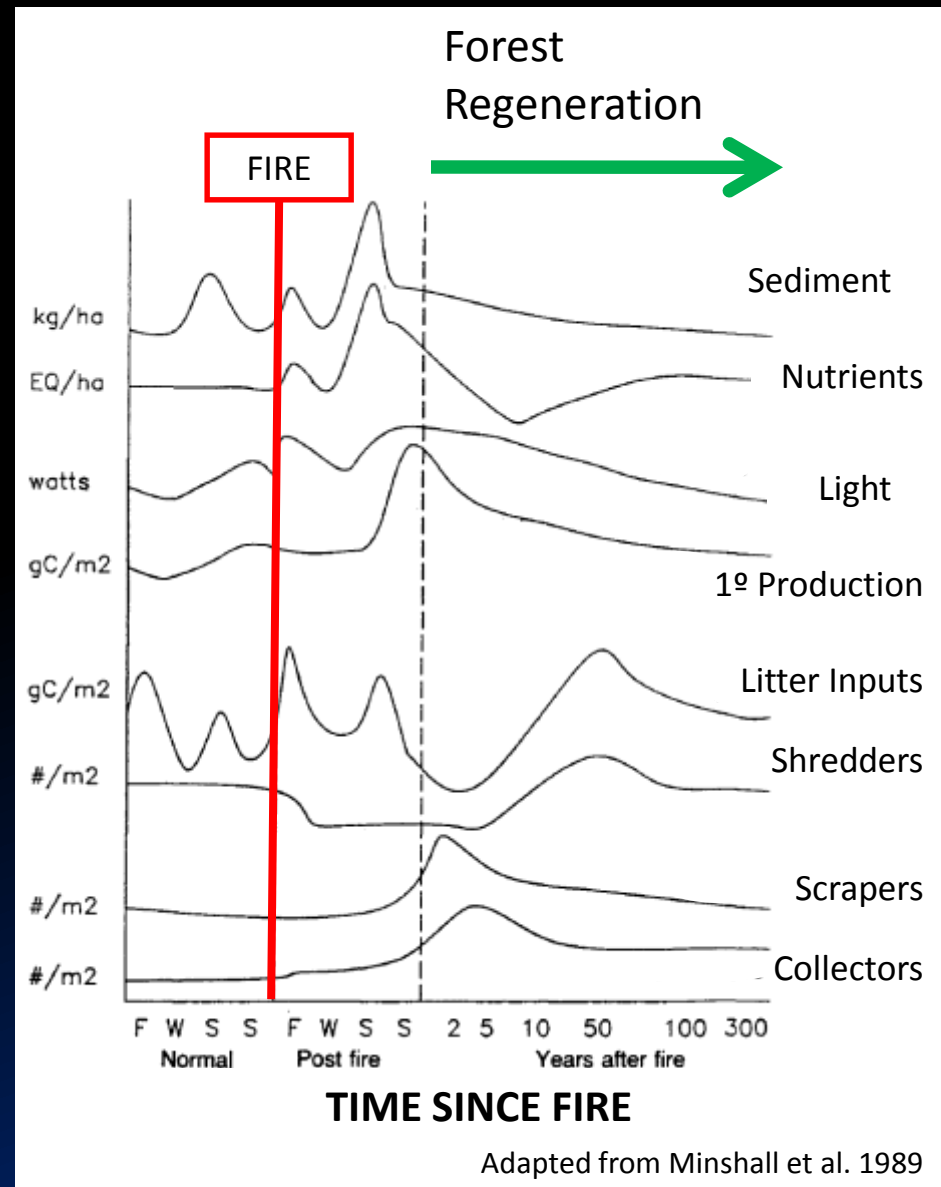
S, 2007

# Hypothesized Effects on Stream Ecosystems

- Immediate / Short term (to end of 1<sup>st</sup> year)  
Increases in Light, Nutrients, Sediment input,  
and Alterations to Hydrology
- Mid term (~2 to ~10 yr post fire)  
?
- Long term (~10 yr +)  
???

# Hypothesized Effects on Stream Ecosystems

- Assumes Dynamic Equilibrium
- Return to Pre Fire Conditions



# Evidence for Shifting Vegetation States

- Shifting ecotones in SW (Allen and Breshears 1998)
- Increasing tree mortality rate (van Mantgem et al. 2009)
- Decreasing tree basal area (van Mantgem et al. 2009)
- Low seedling recruitment in Salmon Basin, Idaho (Nelson & Pierce 2010)

*See Davis et al. Ecosystems (2013) for Review*

# Post-Fire: Limited Conifer Regrowth

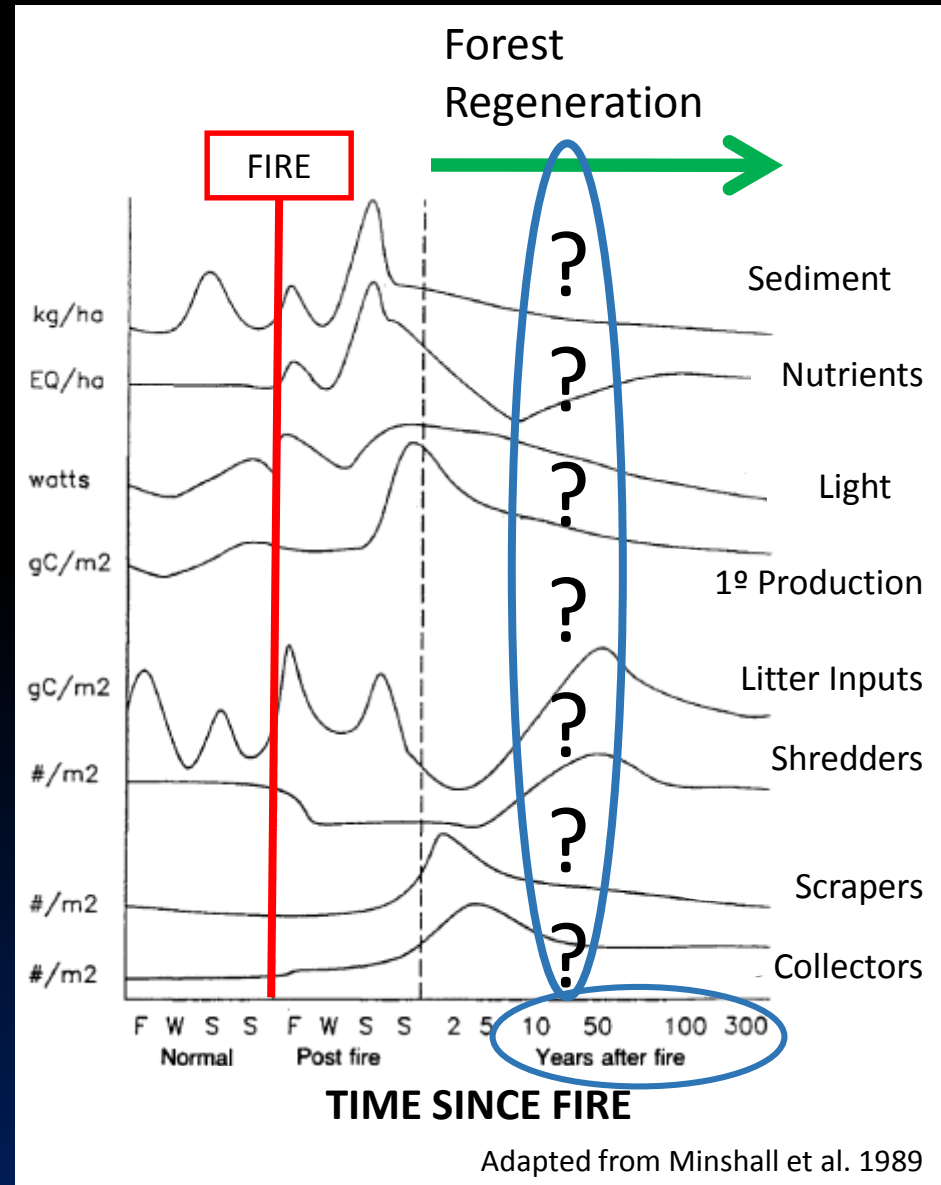


Mortar Creek Fire, Burned 1979, Photo 2012

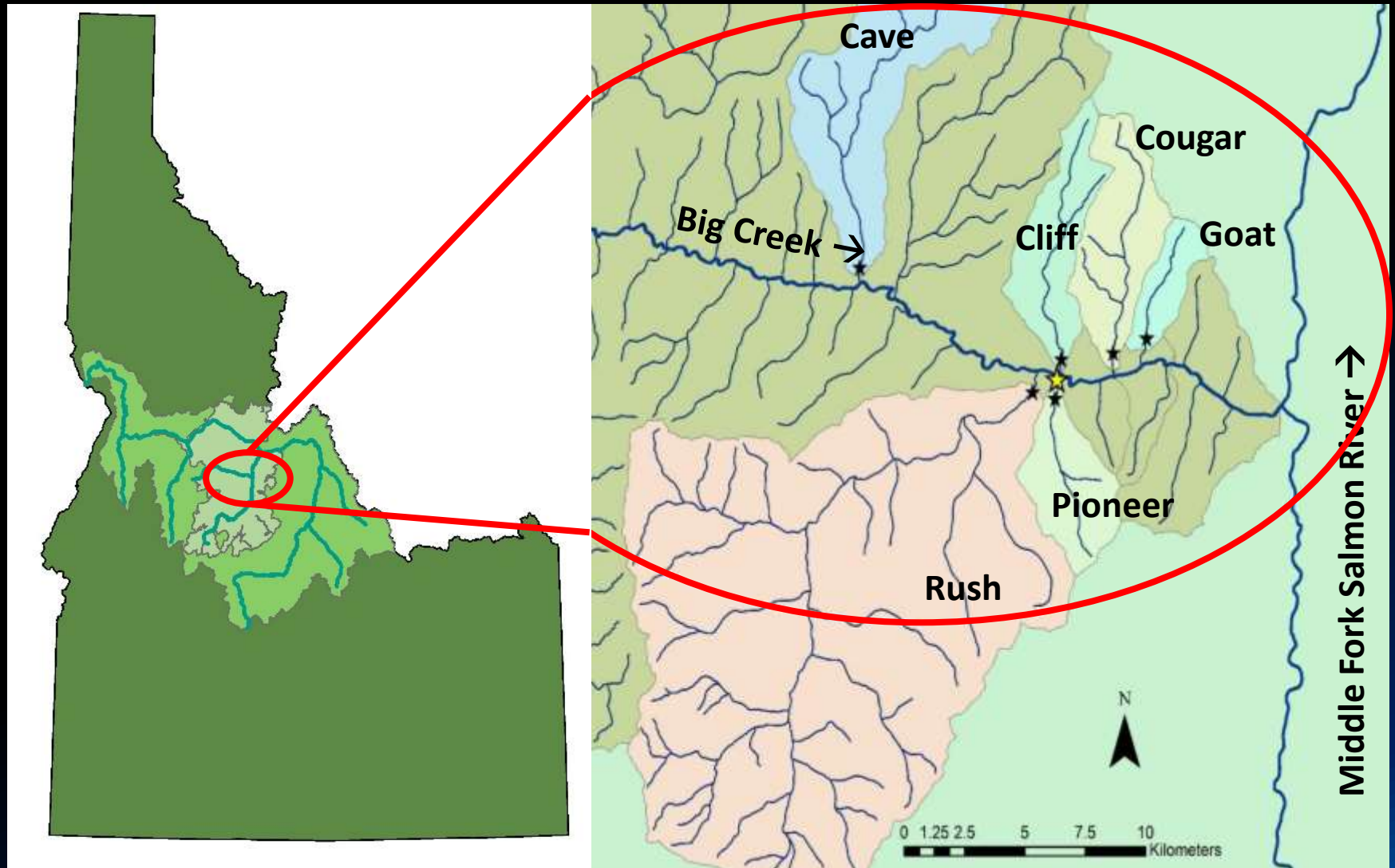


# Hypothesized Effects on Stream Ecosystems

- Assumes Dynamic Equilibrium
- Return to Pre-Fire Conditions

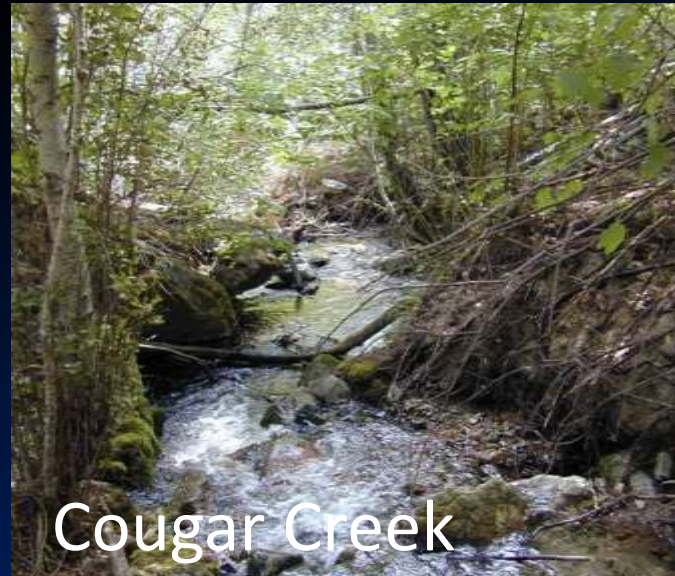


# Long Term Monitoring: Study Sites

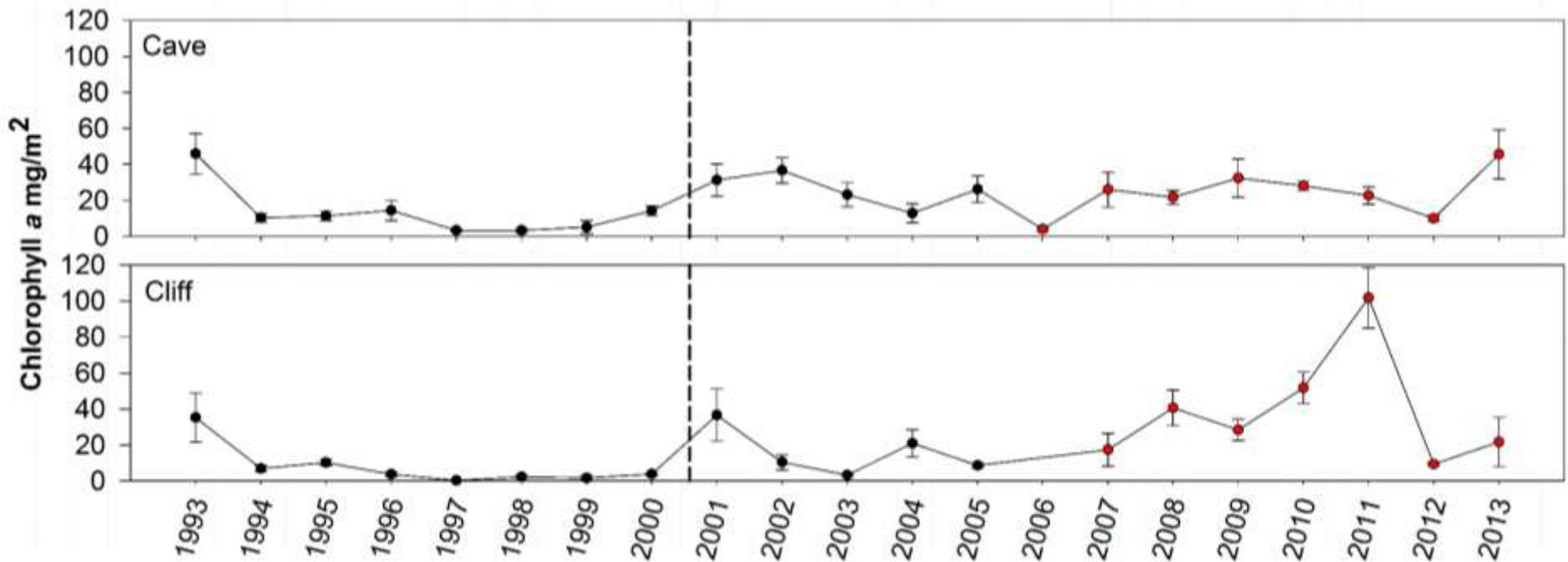




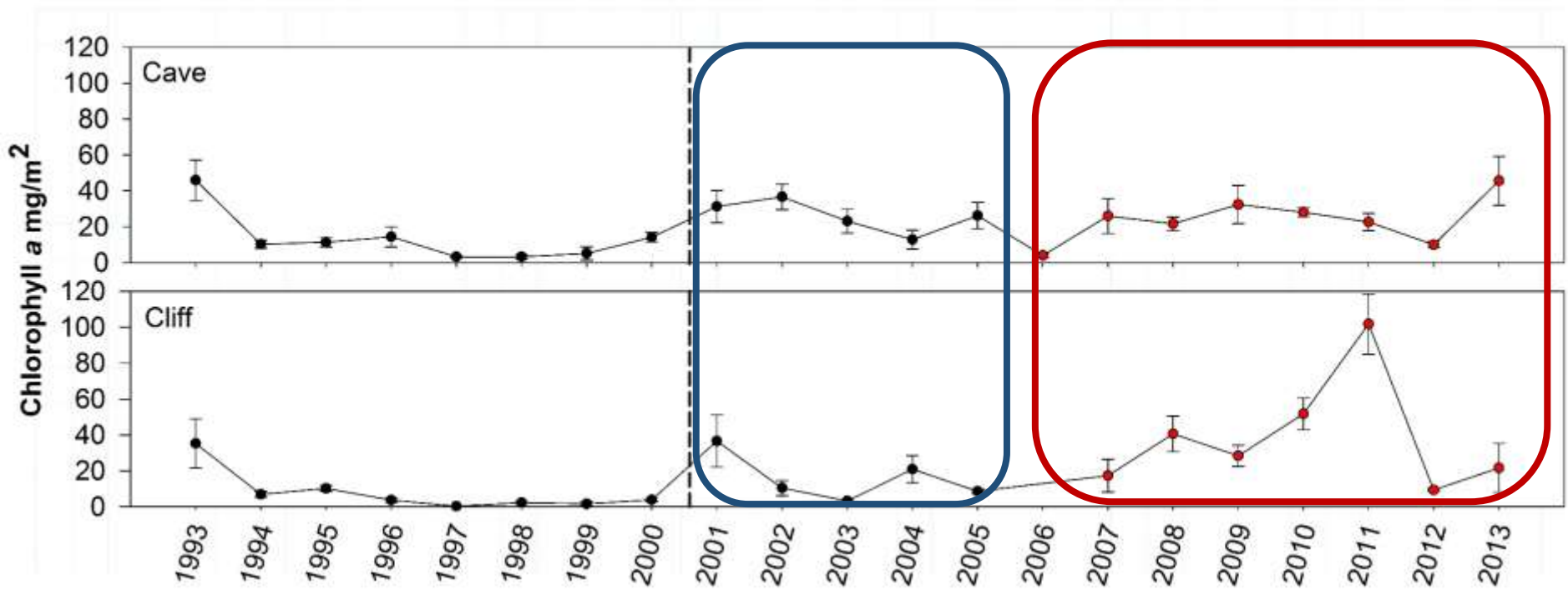
# Divergent Riparian Regrowth...



# Time Series – Chl-*a*: Open Canopy Streams



# Interaction with Climate – Hydrology?



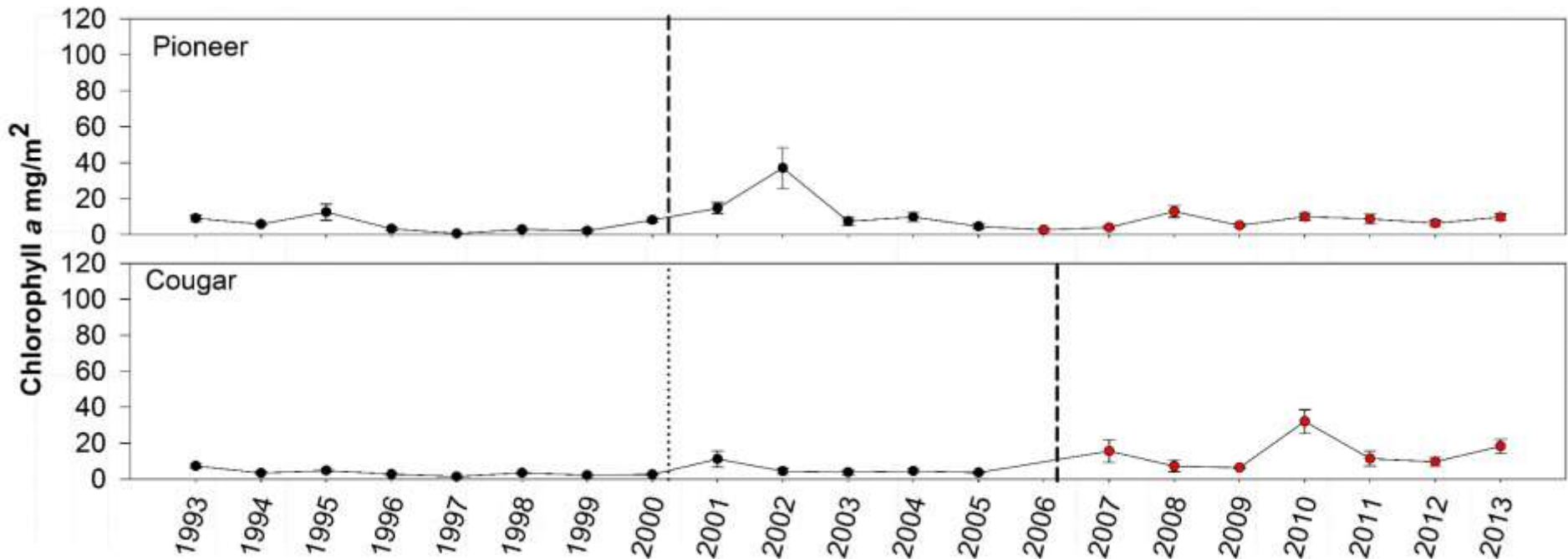
Reduced snowmelt & low peak flows



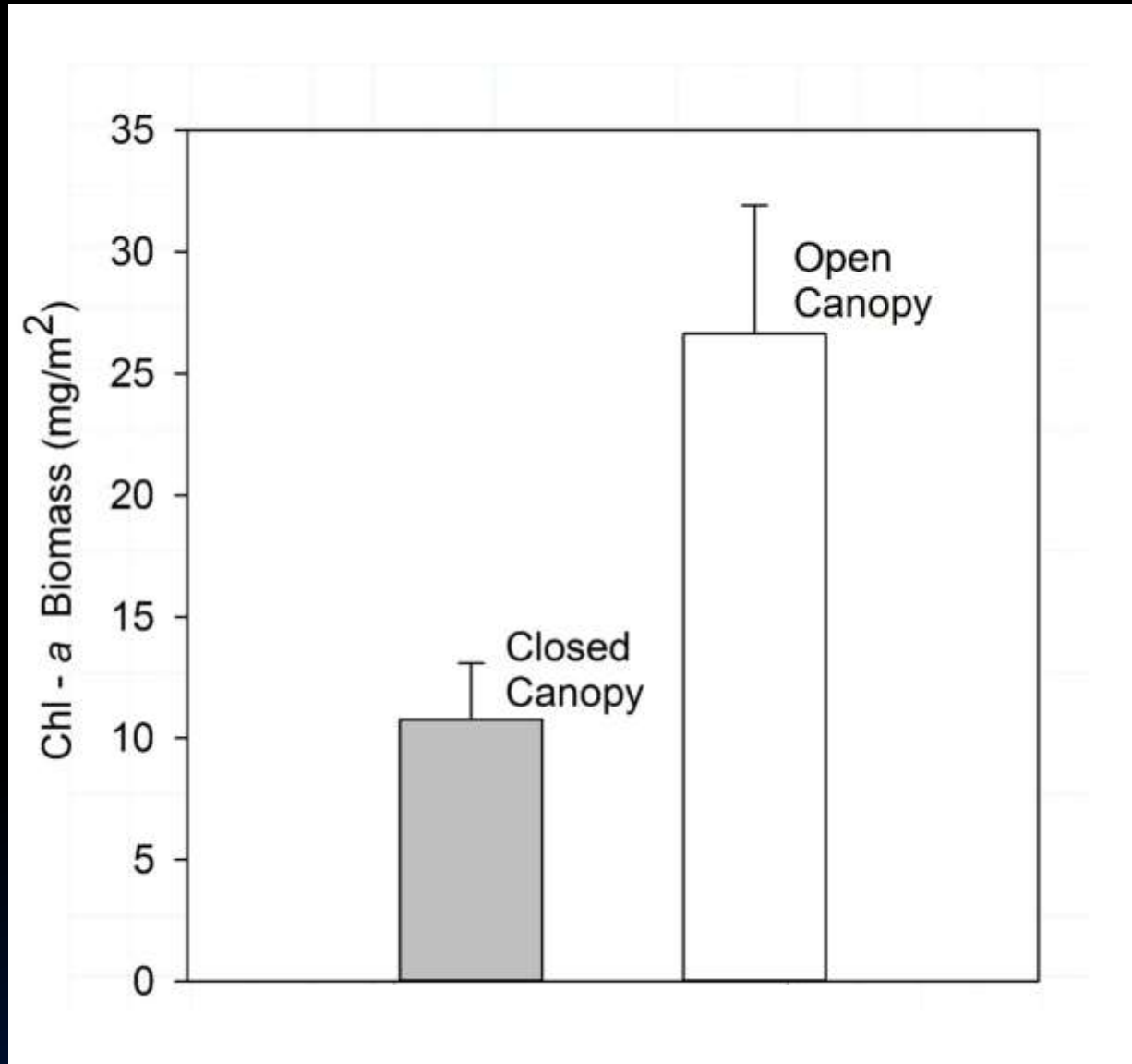
Higher periphyton biomass

*Davis et al. Fresh. Biol. (2013) & Rugenski & Minshall Ecosphere (2014)*

# Chl-a biomass: Closed Canopy Streams



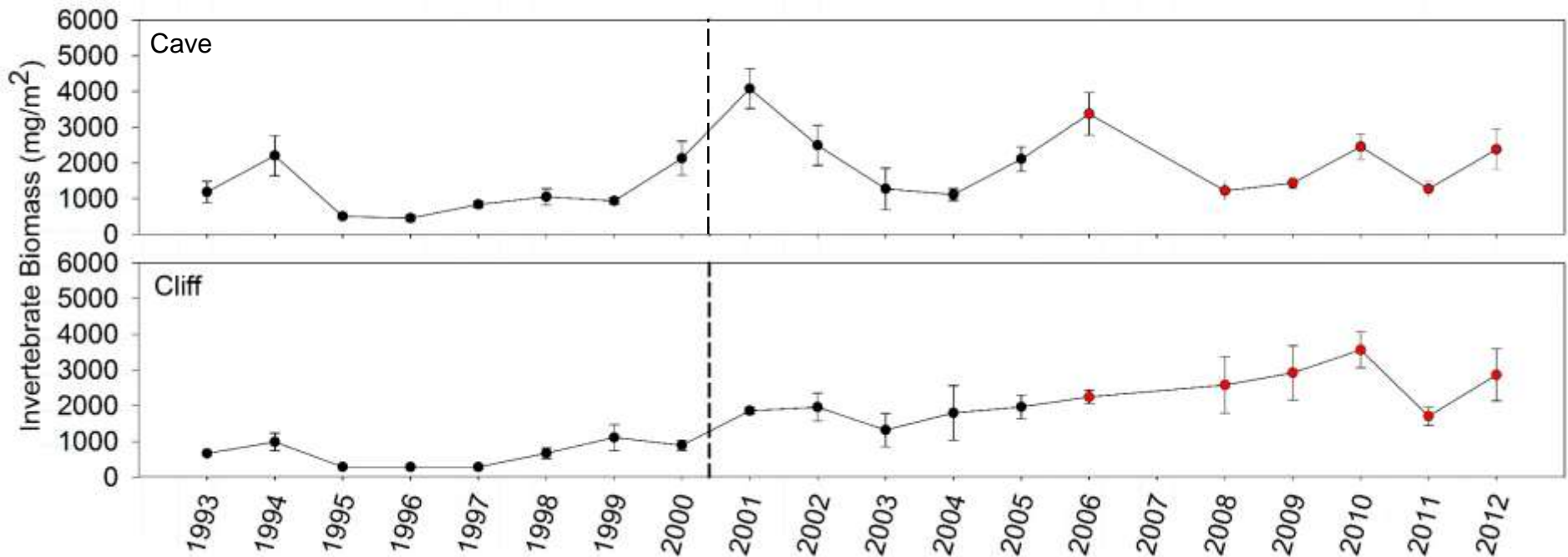
# Periphyton Chl-a Biomass: Averages





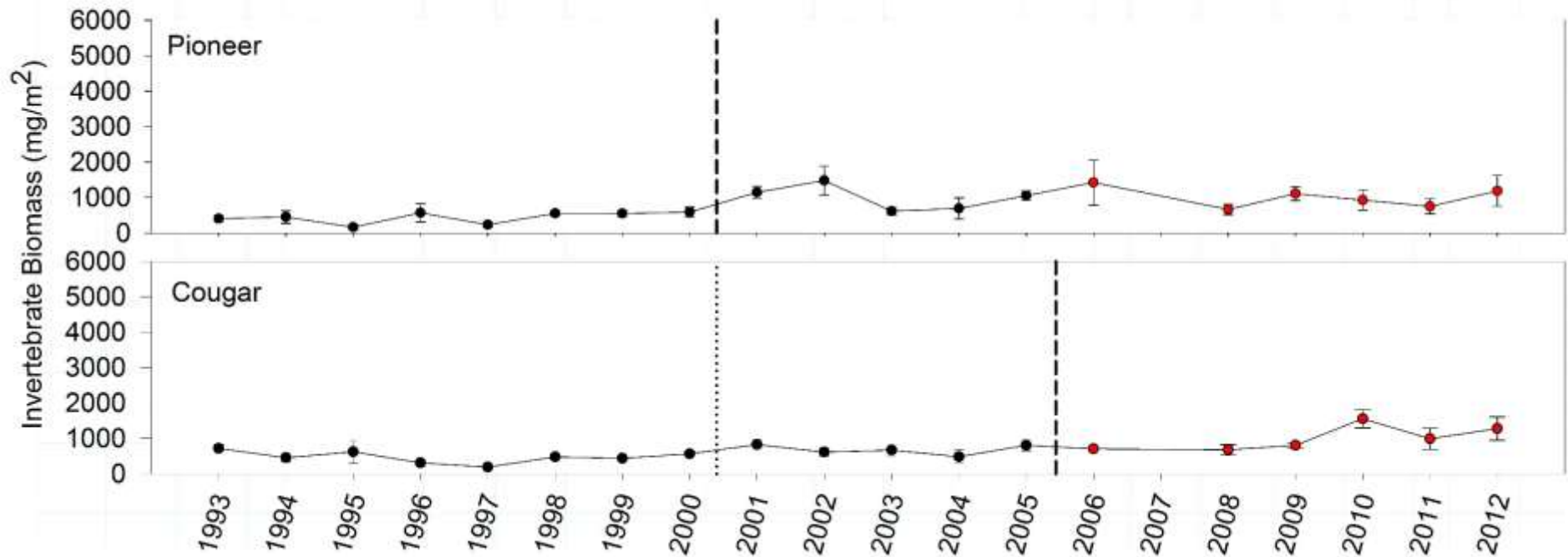
# Time Series – Invert Biomass:

## Open Canopy Streams

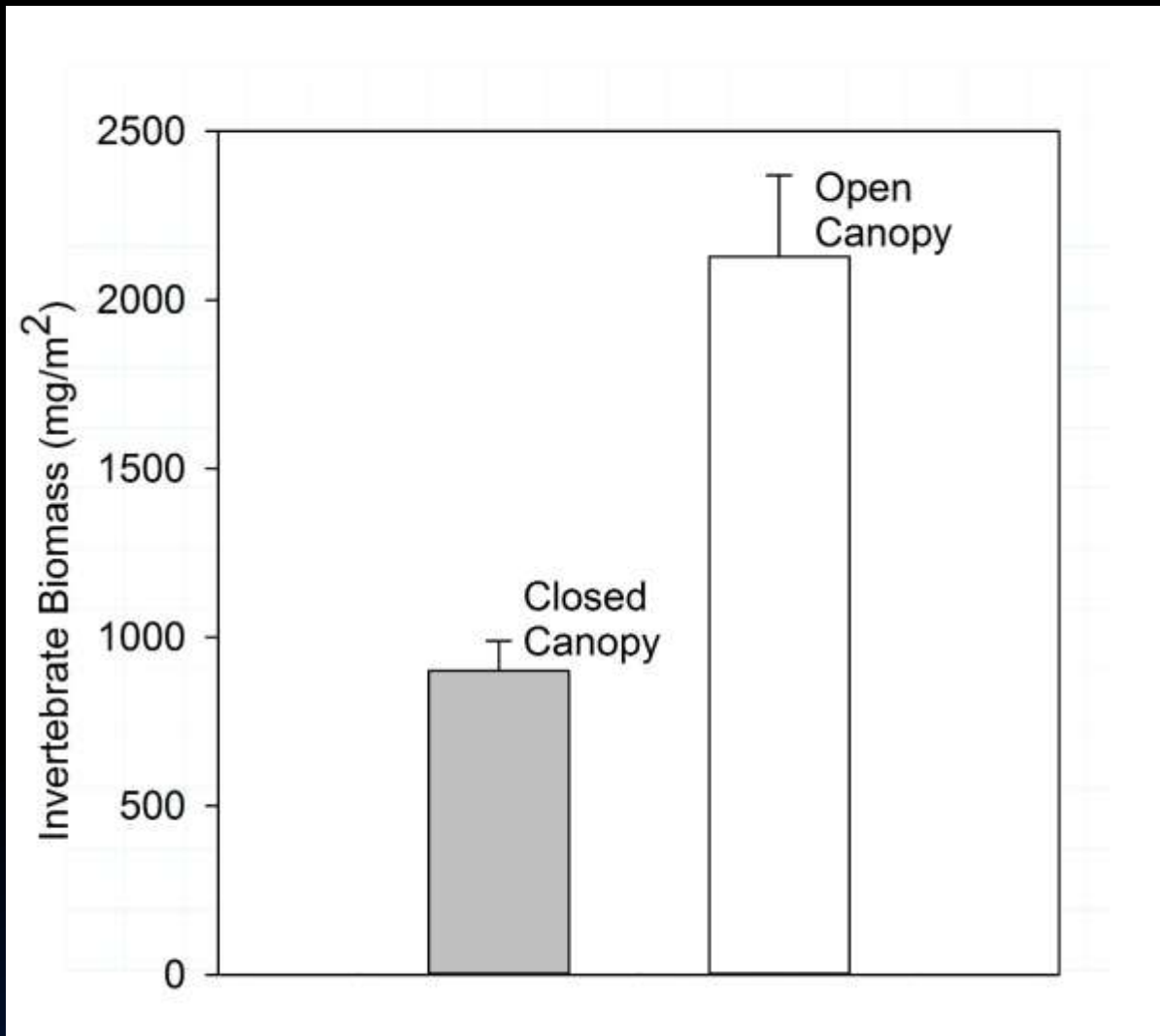


# Time Series – Invert Biomass:

## Closed Canopy Streams



# Invertebrate Biomass: Averages



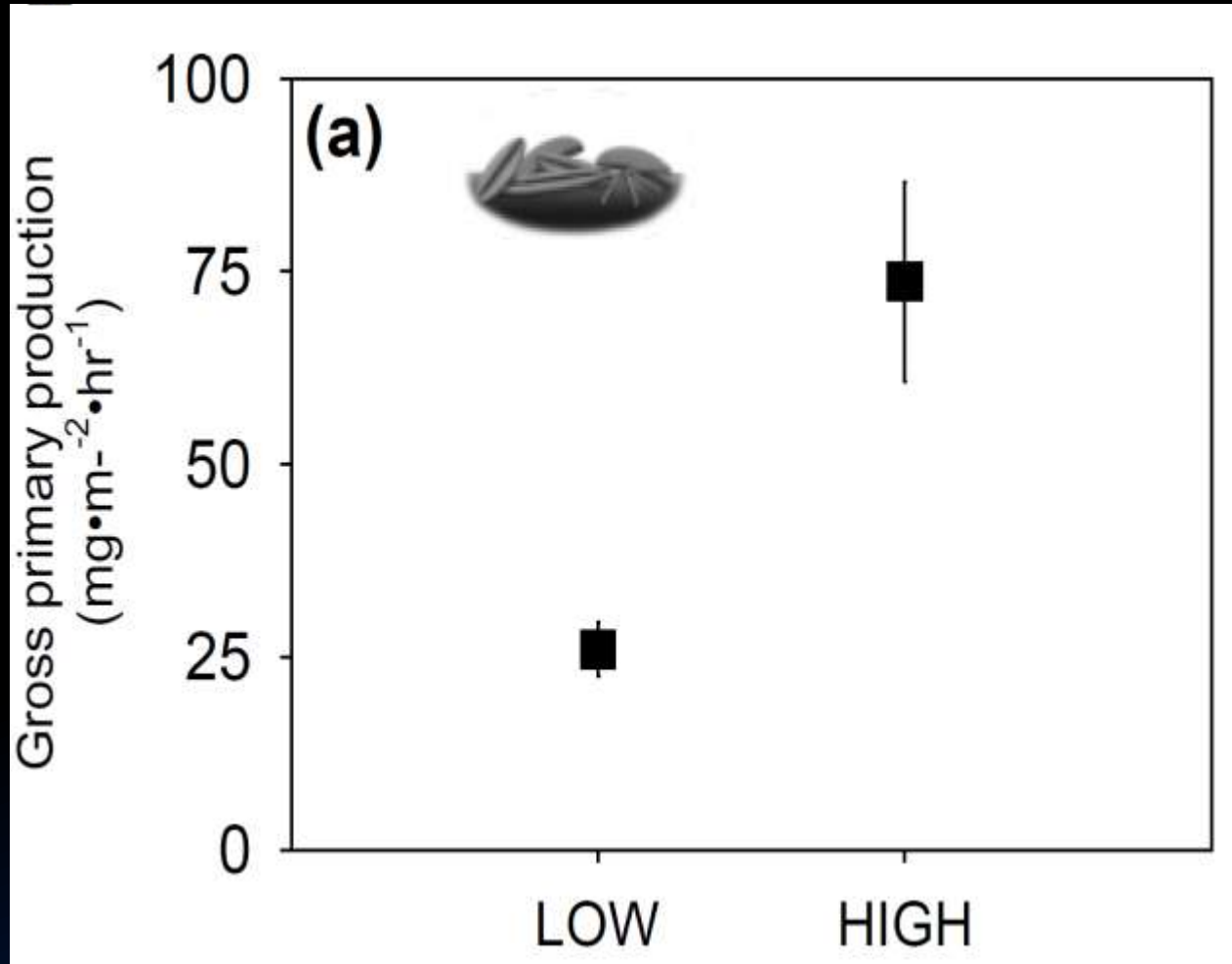
# Primary Production

Tess Gardner



Chamber incubations

# Primary Production – High vs Low Light Streams





# Secondary invertebrate production

Rachel Malison



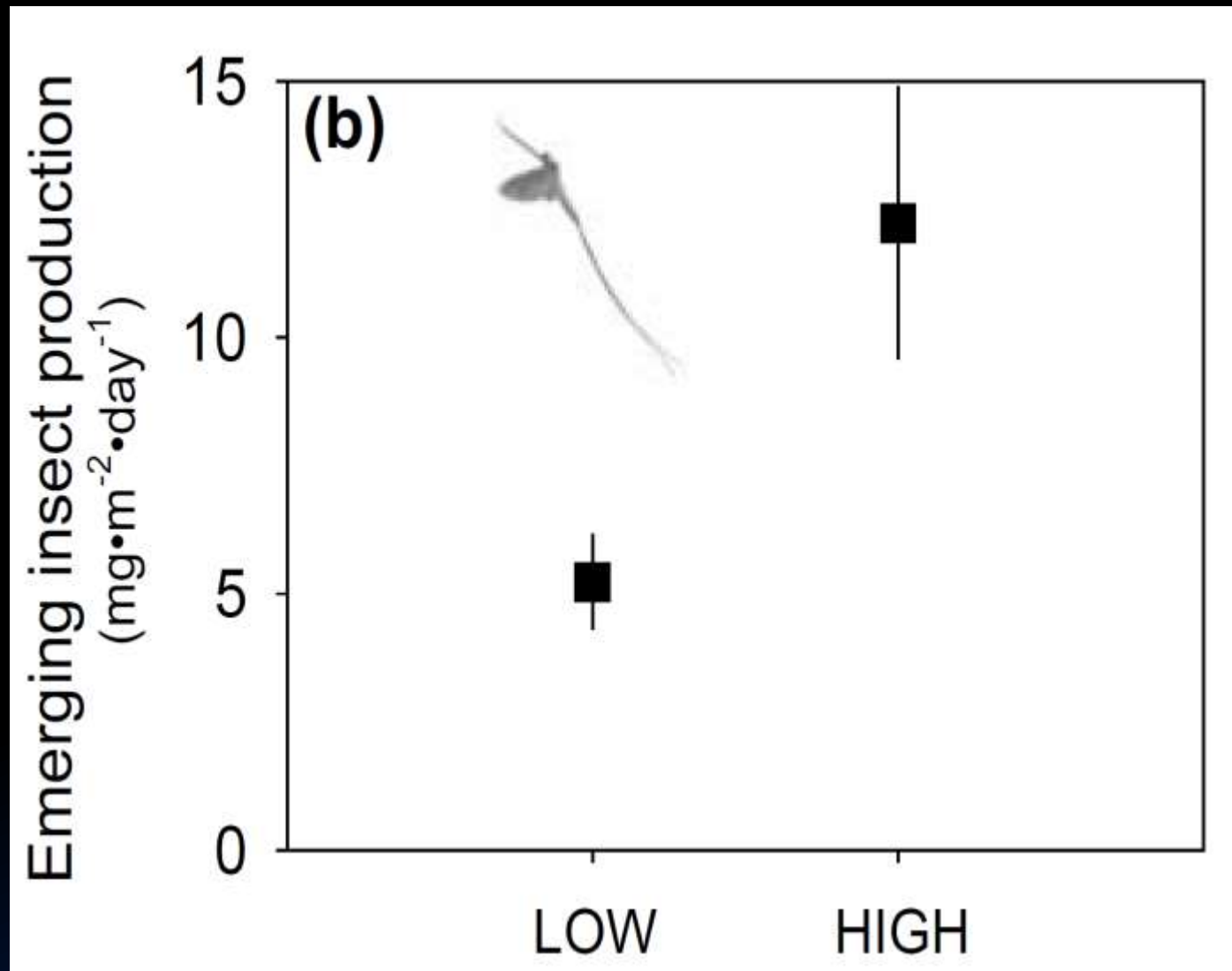
Adult insect emergence

Matt Schenk



Benthic Production

# Emerging Insect Production



# Summary & Future Directions

- Pulse of 1° and 2 ° productivity appears to extend mid to long term
- Mediated by climate (esp. flows) and post-fire trajectory of riparian regrowth
- Hypothesis – light a principal driver
- Importance of multi-generational studies!

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